

Testing to the Sound of the Guns

The Comparative Testing Office

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When soldiers in the 116th Brigade Combat Team took fire near Kirkuk, Iraq, they located and captured the attacking insurgents using a gunfire detection system. Afterwards, the soldiers e-mailed the U.S. Special Operations Command (USSOCOM) program office responsible for obtaining the system, saying, "Thanks so much for getting this system and training to our soldiers."

The gunfire detection system was developed in France and tested by USSOCOM using programs within the Office of the Secretary of Defense's Comparative Testing Office (CTO). The programs rapidly find and test U.S.- and foreign-developed technologies for warfighting use. For program managers, the CTO programs allow them to speed the acquisition process and avoid research and development (R&D) costs. For warfighters, the CTO programs' tested technologies can solve battlefield problems as well as cut support costs. For some industry participants, the programs provide an opportunity to enter the U.S. defense market for the first time.

Burns is the director of the Comparative Testing Office.



Hunting for Technology

Defense R&D is more widespread than ever before. In 1981, a few large companies—those with more than 25,000 employees—did 70 percent of U.S. industrial R&D. By 2006, a wide range of smaller companies were doing most of the R&D. For example, a small, 200-employee company in Washington state developed hermetically sealed cooling for electronics, reducing a system's size and weight. The invention is finding applications across defense product lines.

Defense R&D spending is spread across the globe. Today, 56 of the world's top 100 defense companies (by revenue) and three of the top 10 companies are foreign-based and are producing quality products. For example, world-class ordnance is now provided by such companies as Sweden's SAAB Bofors Dynamics, Germany's Rheinmetaal, and the United Kingdom's Royal Ordnance, to give a few examples.

Many users scout the expanding R&D landscape for new technologies they can quickly use. It's called "open innovation" by University of California-Berkeley Professor Henry Chesbrough and others. It's about "how external technologies can fill the gaps in a company's current business," wrote Chesbrough in his book, *Open Innovation*. About half of Proctor & Gamble's new products are developed externally; and companies like Intel, Merck, and Cisco follow a similar strategy.

And so do others. Iraqi insurgents have sought and acquired high-tech systems like night-vision devices. The Hezbollah use unmanned aerial vehicles and have built missile arsenals surpassing other nations' inventories. The Department of Defense must stay ahead in the race for technology.

Speed counts in meeting the rapidly changing challenges of the battlespace as well as the marketplace, and that means we must harness today's technologies to meet those challenges. In today's security environ-

The Foreign Comparative Testing Program helped DoD avoid \$7.6 billion in R&D costs. The Defense Acquisition Challenge Program avoids \$9 in R&D and maintenance cost for every \$1 spent on testing.

ment, warfighters can't wait years for the 99 percent solution. As Secretary of Defense Robert Gates has stated, "Stability and counterinsurgency missions require 75 percent solutions over a period of months." U.S. warfighters face asymmetric threats, and they must use the best technology they can find to counter those threats.

Leveraging Technology—What it Means for Acquisition and Warfighting

The CTO is a small office within the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, within the Office of the Director for Defense Research and Engineering. It selects Service- and USSOCOM-nominated projects and then funds the acquisition of test articles and subsequent testing. Through highly skilled offices in the Services and USSOCOM, testing is completed and future procurements are planned. Over the last few years, the CTO, Service, and USSOCOM offices have "tested to the sound of the guns," rapidly finding and testing U.S.- and foreign-developed technologies for warfighting. Two complementary programs are overseen by the CTO, enabling it to find and test technologies:

Defense Acquisition Challenge Program. This program domestically searches for and tests U.S. technologies. It allows anyone, in or outside defense, to propose technologies that could rapidly improve acquisition programs; and that includes performance, manufacturability, and/or affordability. Each year, the program issues a broad area announcement in *Federal Business Opportunities* requesting such proposals. Since its inception in 2003, the program has initiated 119 projects involving companies in 33 states.

Foreign Comparative Testing Program. This program globally searches for and tests foreign technologies. Program personnel search for foreign technologies at trade shows, in publications, and through business and government contacts. The program annually solicits technology proposals from the Services and USSOCOM that have the potential to

meet warfighter requirements. Since its inception in 1980, the program has initiated 601 projects involving 29 allied and friendly countries.

Both programs have a high procurement rate. Over the last eight years, 80 percent of the projects that tested successful led to procurements. The reason is a disciplined process focused on Service and USSOCOM needs, and a "test-to-procure" policy. For 2009, 75 technologies were proposed as projects for both programs. Of those, 24 were selected for testing. The CTO reviews each proposed project for innovation, technological maturity, and ability to meet warfighter needs. Additionally, the office verifies a successfully tested technology has a viable procurement path planned.

The programs save R&D funds, helping program managers avoid major R&D costs by leveraging already-developed technologies. For example, the RG-33 Mine Resistant Ambush Protected Vehicle program used a German aluminum alloy ballistic liner that offered better protection than other lightweight materials. The program's use of the German aluminum alloy allowed DoD to avoid an estimated \$2.5 million had a comparable material been researched and developed, while a U.S. Army evaluation through the Foreign Comparative Testing Program cost only \$521,000.

Over the last 29 years, the Foreign Comparative Testing Program has helped DoD avoid a total of \$7.6 billion in R&D costs. On average, it has provided program managers with a 7-to-1 cost avoidance—avoided \$7 in R&D and maintenance costs for every \$1 spent on testing. The much-younger Defense Acquisition Challenge Program is providing about 9-to-1 cost avoidance.

The programs also accelerate fielding. Many projects complete Service/USSOCOM testing in about two years, with some finishing faster. For example, the Marines needed a combined heating, cooling, and generator unit towable by a Humvee. Within a year, the Marines tested products through the Defense Acquisition Challenge Program and fielded a solution. On average, the Foreign Comparative Testing Program cuts fielding timelines by about five to seven years.

Significant Impact

The programs' tested technologies often don't get big headlines, and some seem technologically unexciting. But they can have big impacts for warfighters.

New Capabilities

The programs can quickly test systems that fill capability gaps. When Special Forces operators needed a new rifle, the Foreign Comparative Testing Program came up with a Belgian-developed Special Operations Force Combat Assault Rifle—the first modular rifle with enhanced accuracy at extended ranges. Today, Afghanistan- and Iraq-bound medics get realistic training on a Florida-based company's Mini-Combat Trauma Patient Simulation System, which is

a computerized mannequin simulating combat injuries that was tested by the Defense Acquisition Challenge Program.

Improved Performance

The programs help insert new technology into existing systems, enabling them to do more. For example, Marine Corps M1A1 tank gunners used to keep one eye glued to a sight to view infrared target images. After going through the Foreign Comparative Testing Program, the Marines incorporated a British-developed Biocular image control unit into the M1A1 tank, allowing gunners to kick back and look at the picture, thus reducing fatigue and improving crew performance. After use in Iraq, tank gunners gave the following feedback:

- “Picture was unbelievable!”
- “We could view buildings over 5,000 meters away and call in the ten grid information for strikes.”
- “With the improved resolution of the system, we used it to look for and find IEDs.”

Similarly, the Army’s Black Hawk helicopter is getting increased range and climb rate as a result of materials in its tailcone being replaced by lighter-weight materials, called X-Cor™ and K-Cor™, successfully tested by the Army through the Defense Acquisition Challenge Program.

Faster Warfighting

Speed in war is essential, as noted by historical military strategists such as Carl von Clausewitz and Sun Tzu; and the programs’ tested technologies are accelerators. In Afghanistan and Iraq, artillery units cut their set-up time for firing by one-third through the use of a Swiss-developed system that accurately positions the unit’s guns relative to maps and earth terrain. It was assessed through the Foreign Comparative Testing Program. And today, one Marine, using software tested by the Defense Acquisition Challenge program, can plan communications for an upcoming operation in 20 minutes, thus replacing a previous process taking two Marines up to 24 hours to complete.

Extended System Use

Through Defense Acquisition Challenge Program testing, the Air Force found ceramic matrix composite seals for F-16 jet engine nozzles lasted six times longer than older metallic seals. And a Russian-developed titanium nitride coating has reduced sand erosion in turbine engines in Navy and Marine Corps helicopters operating in Iraq and Afghanistan today, increasing their flying rates tenfold over those in Operation Desert Storm, thanks to the Foreign Comparative Testing Program.

Reduced Maintenance

Sailors on aircraft carriers frequently had to replace nitrogen bottles that cooled infrared seekers in Sidewinder missiles. That maintenance was eliminated with a United Kingdom-developed and a Foreign Comparative Testing Program-tested high-pressure pure-air generator, saving about \$50 million in life cycle costs. Additionally, a Defense Acquisition

Challenge Program-evaluated system for troubleshooting aircraft jamming pods reduced maintenance and required less calibration than previous systems.

Broader Value

While the CTO helps warfighters and program managers, its impact goes far beyond supporting just those in DoD—it is expanding the defense industrial base. Over the last three years, more than 25 percent of the companies with winning proposals under the Defense Acquisition Challenge Program had not done previous business with the Defense Department. They also bring some non-traditional thoughts and development to the department.

An example is a Georgia-based medical technology company. It proposed, via the Defense Acquisition Challenge Program, an acoustic shockwave therapy for warfighters’ soft tissue wounds—an anesthesia-free, non-invasive, easy-to-use treatment promising rapid healing. The Army is now evaluating the technology.

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The programs are also creating jobs. Defense Acquisition Challenge Program projects have led to production in 36 states. There is a perception that the Foreign Comparative Testing Program takes jobs and business away from the United States; in reality, it is the exact opposite. Most Foreign Comparative Testing Program procurements lead to licensing agreements with the foreign developers, resulting in technology being manufactured in the United States. An example is the widely used Buffalo mine-clearing vehicle, which was developed by a company in South Africa but is now produced by a South Carolina-based company that makes hundreds of vehicles for U.S. and allied nations. To date, manufacturers in 33 states have produced technologies through the Foreign Comparative Testing Program.

Additionally, the programs are helping defense “go green,” and they are helping program managers meet environmen-

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improvement. There are three areas in which many organizations focus their effort to improve communications—training leaders in interpersonal skills; matching the organization's information/communication requirements with the appropriate communications medium (e.g., e-mail, face-to-face, portals, meeting rhythms, workflow tools, net-based meetings); and including the workforce in the problem-solving process (to include developing processes that address workflow improvements). If you want to see leaders (and their subordinates) improve organizational communications, you have to provide the need for change, the value of changing, and a path forward to improving communications. Consider workshops focused on the leadership team. Such workshops have proven highly effective in the joint development of communications skills and processes (public speaking, counseling, building communication/information management systems, staff coordination, etc.).

"I rarely have communication with my supervisor. We don't have staff meetings. We mainly communicate via e-mail. If he comes in my area, he generally only speaks to the person he has an issue or concern with at that time."

-Survey respondent

Keep the Plates Spinning

Developing mid-level and senior leaders have a challenge to keep the plates spinning. They must understand how to build and oversee control systems (output control, behavior control, and cultural control systems) along with the feedback tools that tell them when the control systems are not working at peak efficiency. A climate survey is a principal feedback tool that can help you understand when the plates need energy and attention, thereby improving your team's performance.

Do you know which plates need your attention? If you do decide to use a survey as a feedback tool, it should be tailored to include not just numerical scores but also several opportunities to generate anonymous comments in text boxes from which you can learn your organizational strengths and challenges. Once you have identified your organizational weaknesses, develop a plan to fix them. Strategically communicating your intentions after the survey is critical. Some successful techniques we have seen include holding a town hall meeting to brief the results and announce that teams (to include Lean Six Sigma/process teams) have been formed to deal with the survey issues. Those teams should provide frequent action plan feedback to the senior leaders as well as to the workforce. Organizations that use such techniques have found improved workforce motivation and significant organizational improvement.

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tal requirements. Marines train with a Foreign Comparative Testing Program-tested 40mm practice round that produces an orange flash but leaves no energetic material. Future trucks will likely have environmental control units using a carbon dioxide refrigerant instead of environmentally harmful synthetic refrigerants, thanks to the Defense Acquisition Challenge Program. And in 2009, a United Kingdom-developed disposal system that thermally destroys 90 percent of waste and uses the resulting gases to generate electricity will undergo foreign comparative testing for the Army's forward operating bases.

Significant Value

The CTO programs—the Foreign Comparative Testing Program and the Defense Acquisition Challenge Program—quickly provide U.S. war-fighters the equipment they need to fight asymmetrical wars while saving the taxpayers dollars in the process, but here's their greatest value: they save lives. It's common to say that about a piece of gear. But it's not folks in Washington, D.C., saying it—it's the warfighters. Here are just a few comments warfighters have made:

- "Catching the bad guys equates to saving lives," said users of the gunfire detection system, tested by the Defense Acquisition Challenge Program.
- "We appreciate the help and, truthfully, the lives you probably saved," said a medevac commander referring to MobiMat landing pad, tested by the Foreign Comparative Testing Program.
- "That giant armored beast is no doubt saving lives," said a user of the mine-clearing Buffalo, tested by the Foreign Comparative Testing Program.

And therein lies the most significant reason for considering the Defense Acquisition Challenge and Foreign Comparative Testing programs in your program management office.

For more information, please visit the Advanced Systems and Concepts Web page at <www.acq.osd.mil/asc/>.

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